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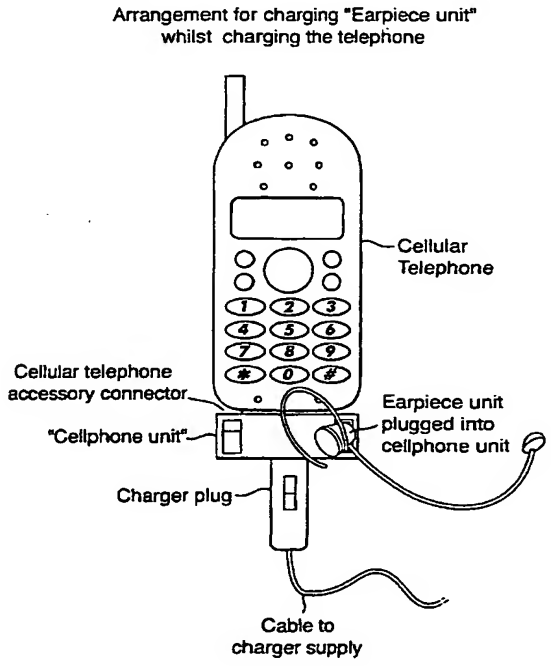
(54) Title: AN ACCESSORY FOR A MOBILE TELEPHONE



Note:It is also possible to load frequency and code data from the "cellphone unit" to the "earpiece unit" during charging

(57) Abstract: The invention relates to an accessory for a mobile telephone. The accessory includes means for connection to the telephone so as to enable to way data transfer to the telephone and an earpiece, which in use is worn. Data is transferred to/from the earpiece from the telephone in digital format. Coding of the data can occur in order to avoid interference. The accessory may be configured to operate in a Time Division Multiplex Address (TDMA) mode or Frequency Division Multiplex Address (FDMA) mode.

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(AM, AZ, BY, KG, KZ, MD, RU, TJ, TM). European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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An Accessory for a Mobile Telephone

This invention relates to an accessory for a mobile telephone.

Mobile telephones are highly prevalent and are increasingly used as a main form of communication as costs of telephones and call time decreases. Often mobile telephones are used in a so-called "hands free" mode, for example when working or when driving a vehicle. As the number of units increases, there is a corresponding increase in the risk of interference or cross-talk between two or more telephones.

The present invention arose to reduce these and other problems.

According to a first aspect of the invention there is provided an accessory for a mobile telephone including: means for connecting the accessory to the telephone so that data can be received from and transmitted to the telephone; and means for transmitting data to and receiving data from a remote transponder earpiece; characterised in that the data which is transmitted to and received from the transponder earpiece is digital data.

Most preferably an encryptor/decryptor provides a coded version of transmitted and received data signals from and to the telephone, via the transceiver to the transponder earpeice. The encryptor/decryptor enables a digital signal to be sent and received, thereby removing the risk of interference and greatly increasing security.

Preferably the means for transmitting data to and receiving data from (hereinafter referred to as a transceiver) a remote transponder earpiece is adapted to be connected to the telephone.

A switch is preferably provided on the transponder earpiece which is easily accessible and manually operable. The activation of the switch has the effect of lifting or replacing a handset; that is switching the telephone on or off.

The transponder preferably includes a microphone. Preferably the transponder also includes a rechargeable battery and is adapted to be recharged from an energy source via the telephone. This energy source may be the battery of the telephone or it may be a current source (which charges the battery), which has been suitably modified.

Means for transmitting a security code can be included in the telephone, so that, upon charging or re-charging of the transponder, an enabling or other code signal can be written to a memory in the transponder. Failure of the transponder to receive this code results in it being disabled. This prevents a transponder from being used with an 'unauthorised' telephone.

Embodiments of the invention are described with reference to the figures in which:

Figures 1a to c show general views of a transponder, depicting diagrammatically, microphone and earpiece;

Figure 2 is an overall view of a mobile telephone, showing diagrammatically, a means for transmitting/receiving data;

Figure 3 shows the transponder inserted into the arrangement of Figure 2 for charging/recharging;

Figures 4 and 5 show schematic circuit diagrams of two versions of the transponder, which may be incorporated into the earpiece transponder; and

Figure 6 shows a circuit diagram of an alternative version of the transponder operating in 'TDMA' mode.

Referring generally to the Figures, accessory 10 comprises two main sections, a user worn earpiece/microphone unit (the earpiece transponder) 12 and the cellphone unit 14 (transceiver) which in use is connected to a telephone. Figures 1b and 1c show earpiece unit 13 and microphone unit 15 as separate. Antenna 17 is also depicted.

Telephone quality voice is transmitted between the transceiver 14 and transponder 12. Alternatively data (approx 33Kbits/sec) can be transferred instead of voice data. A 'sequence generator' is included to send preset data sequences if a button on the earpiece is pressed. This can be used to receive incoming calls ('lift handset' function) and similar purposes.

Relatively low RF frequencies are used, typically around 27MHz or 48MHz. This assists in reducing costs and minimises current consumption. In order to ensure that there is no interference or accidental interception of messages by people nearby, transmissions are digital and each user has a code number for a unique encryption code.

To minimise current consumption and complexity, delta modulation is preferred for the digitisation of voice signals. Associated with digital modulation are other circuit blocks, two key circuit blocks are clock recovery in receive mode and splatter filtering prior to modulation, which is necessary to restrict transmitted bandwidth.

Transmitted power levels are relatively low, typically around 0.1mW, since the range of the transponder only needs to be about 2m. As uncompressed digital signals are used, the bandwidth is relatively wide, at least 32KHz is needed each way. For duplex operation, at least 64KHz is required.

In the embodiment shown in Figure 4, there is depicted an analog-to-digital (AD) modulator 52 converts voice data into digital signals. Digital signals are then sent to radio frequency (RF) transmitter 54. The receive section is shown diagrammatically at 56. Received data is demodulated by demodulator 58. Demodulated data is then amplified, to a desired level by audio amplifier 60.

The embodiment shown in Figure 5 has many sections in common with the embodiment in Figure 4 and differs principally in that no conversion takes place as detection occurs at 49MHz and the signals are filtered and used directly. The fact that there is no down converter reduces the number of components.

To operate in duplex mode one approach is to use different transmit and receive frequencies, but this needs better filtering or different frequency bands. One approach is to use single channel (Frequency Division Multiplex Addressing) FDMA. Howéver, separate channels are used for transmit and receive modes, although clearly some guide band "space" is required between each frequency. When using FDMA less timing control circuitry is required. The levels ensure that interference between users is minimal, unless they are at extremely close range. Because of encryption, the only perceived effects are signal loss. In this scenario about 100KHz of 'quiet'spectrum with the regulatory authorities needs to be identified.

Although reference has been made to FDMA, the invention may also be applied to Time Division Multiplex Addressing (TDMA). TDMA permits several users to operate on the same frequency and rely on the fact that transmission powers are low and receiver capture is of the order of about 10dB.

In order to minimise the size of the transponder, as many functions as possible are integrated into an RF ASIC. This means that various other tasks such as battery save, regulator and charger control are preferably also incorporated into the ASIC.

The invention has been described by way of examples only. Other potential uses are referred to briefly below.

Motorcycle to pillion or rally driver communication system.

With an earpiece unit in each helmet, a very small communication system can be made. A helmet stand may be made to incorporate an inductive loop charger, so no wires or plugs are needed. Transfer or identity code could be via an inductive loop charger. The bike or car could form a third source of voice for satnav commands, and/or intelligent roadside information such as status of fuel gauge.

Use as a tag

With its small size, digital capabilities and range of up to about 3m, this device could be used as a two-way TAG. If a credit (smart) card reader is added to the user unit, it could carry out automatic payments in supermarkets, petrol stations, tollbooths, etc.

Conveying data

If a memory is attached to the user unit, and since the user unit has a unique code, it is possible for the user to carry data from one place to another. This could be used to transfer files from one computer to another without floppy disks. Or in locations such as building sites, data could be transferred from one site office to another without a wearer taking any action other than walking in the right direction. In an airport, if passengers were 'tagged' it could eliminate boarding passes and airlines would know passenger location.

Translation

Since it is possible for the earpiece to define a users language to a host system, the earpiece could be used to give correct language commentaries in museums, exhibitions and conference halls.

Patient and baby monitoring

Units are small and can transfer data over short ranges, so a wireless monitoring system could use suitably modified devices.

Figure 6 shows an example of a system using a TDMA configuration.

The communication between the transponder and the telephone is duplex mode so the user can speak without interrupting the received audio. To minimise the filtering requirements, an embodiment of the invention may use (Time Division Multiplex Access) TDMA and can operate in a single frequency radio channel. An encrypted audio is sent in packets and the transponder alternately receives and transmits these

data packets. The bandwidth of this channel will be more than twice that needed for a single simplex channel.

If transmit power is kept to the minimum needed to maintain communication, then it is possible for most users to be accommodated on a single radio channel. Encryption prevents audible interference from other users.

Other variations to the embodiments described may be made without departing from the scope of the invention.

CLAIMS

1. An accessory for a mobile telephone including: means for connecting the accessory to the telephone, so that data can be received from and transmitted to the telephone; and means for transmitting data to and receiving data from a remote transponder earpiece; characterised in that the means for transmitting data to and receiving data from the transponder earpiece is a digital transponder.

2. An accessory according to claim 1 wherein encryptor means provides a coded version of data prior to transmission.

3. An accessory according to claim 2 wherein decryptor means decrypts received data.

4. An accessory according to any preceding claim which is adapted to be connected directly to the telephone.

5. An accessory according to any preceding claim having switch means which when depressed simulates the lifting and replacing of a telephone handset.

6. An accessory according to any preceding claim which includes a rechargeable battery.

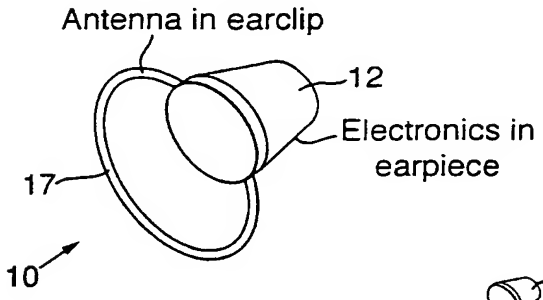
7. An accessory according to any preceding claim capable of operating in a time division multiplex address (TDMA) mode.

8. An accessory according to any of claims 1 to 6 capable of operating in a frequency division multiplex address (FDMA) mode.

9. An accessory according to any preceding claim having means for switching a telephone from receiving voice data to another form of data.

10. An accessory substantially as herein described with reference to the Figures.

Fig.1a.
Combined ear/microphone unit



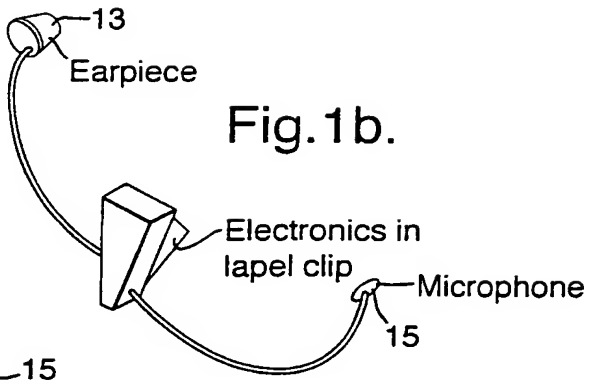
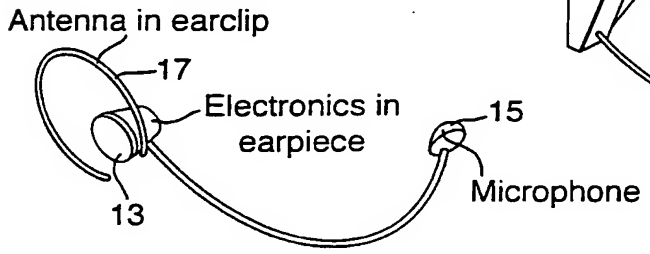


Fig.1b.

Fig.1c.



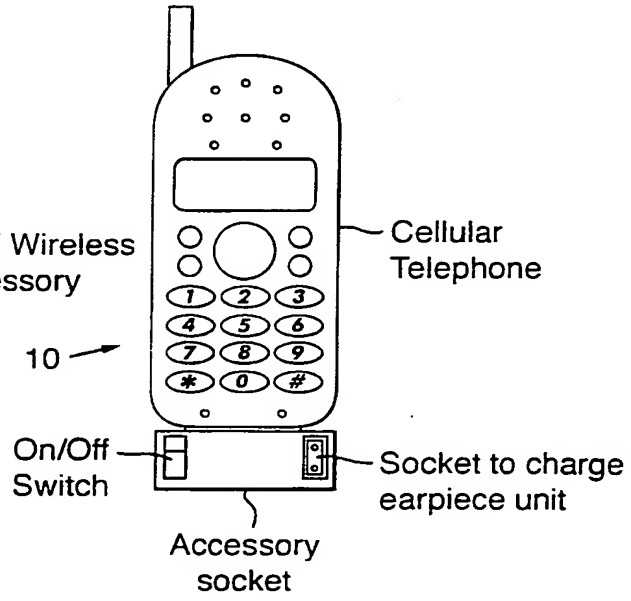
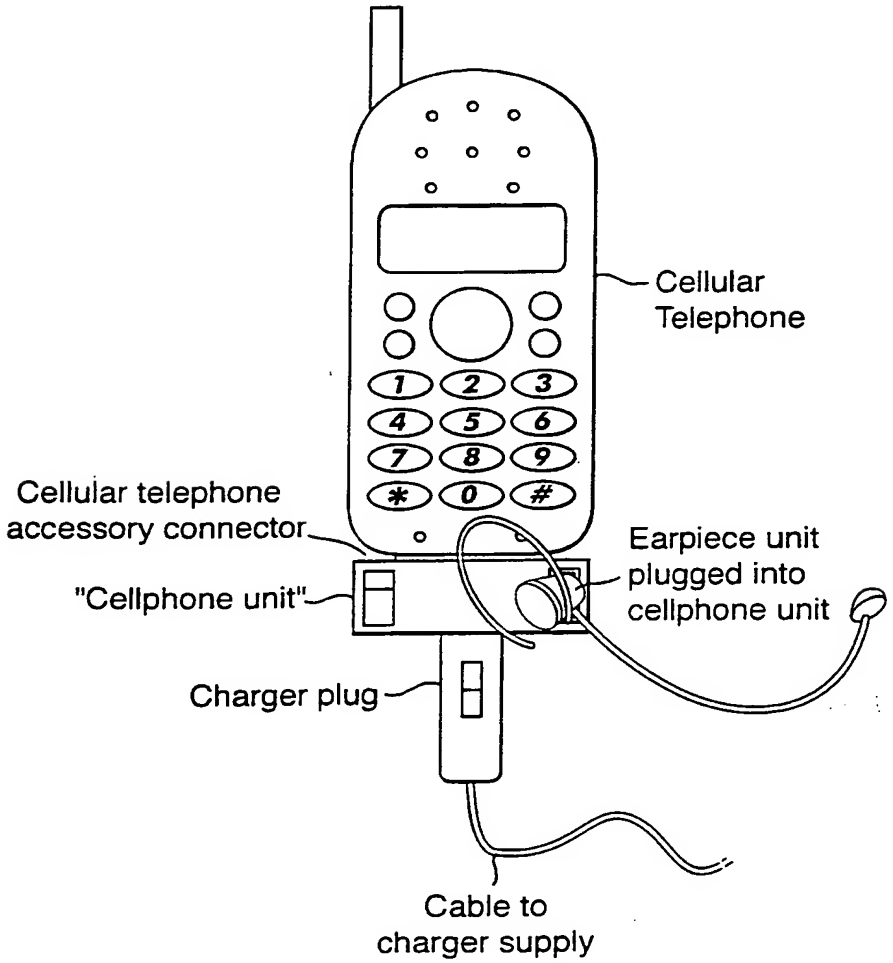


Fig.2.
General Concept of Wireless Handsfree Accessory

Fig.3.

Arrangement for charging "Earpiece unit" whilst charging the telephone



Note:It is also possible to load frequency and code data from the "cellphone unit" to the "earpiece unit" during charging

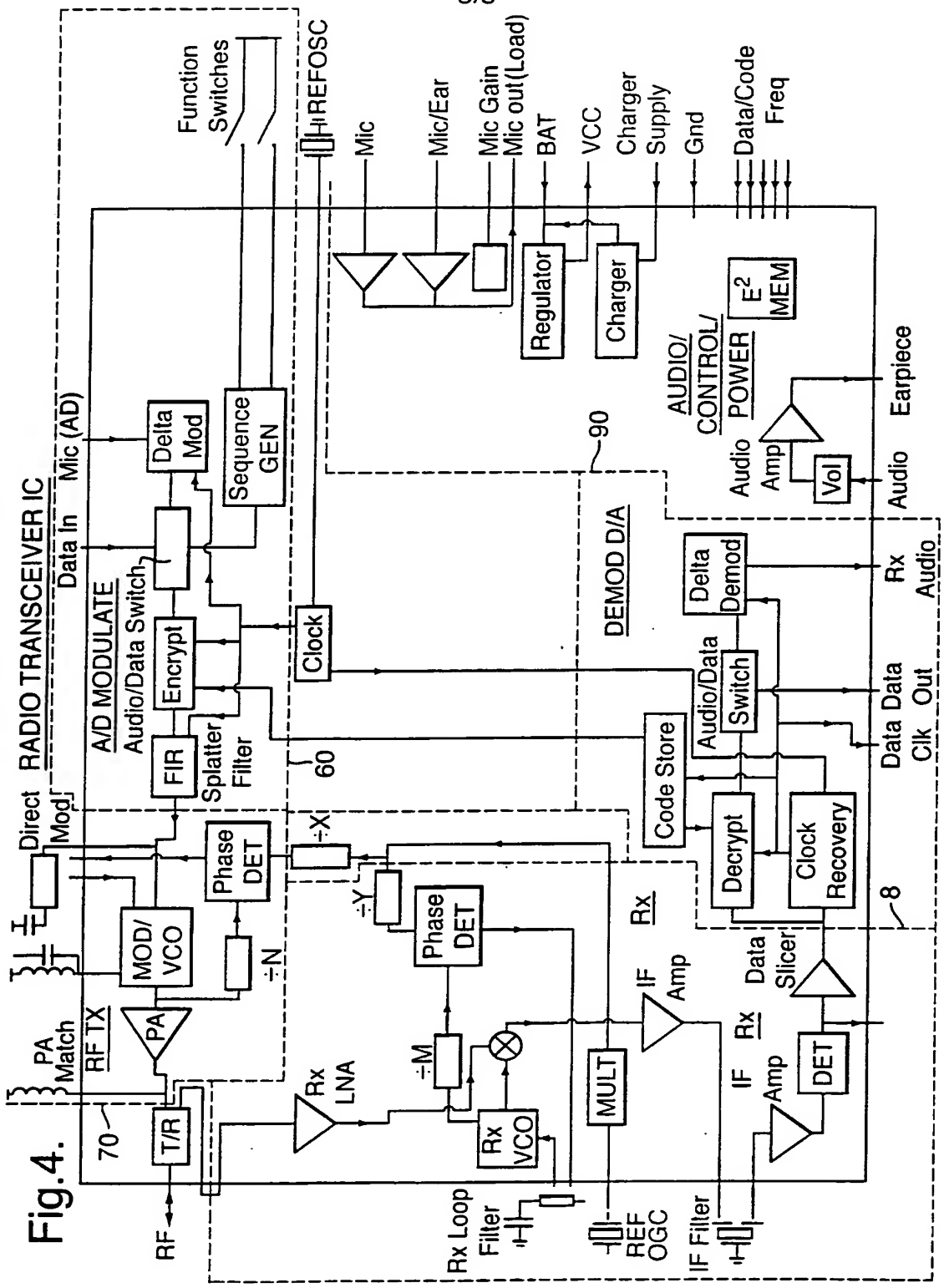

RADIO TRANSCEIVER IC
A/D MODULATE
Audio/Data Switch
Data In
Mic (AD)
Direct Mod
Delta Mod
Sequence GEN
Function Switches
REFOSC
Mic
Mic/Ear
Mic Gain
Mic out(Load)
BAT
VCC
Charger Supply
Gnd
Data/Code Freq
Regulator
Charger
AUDIO/ CONTROL/ POWER
E2 MEM
Audio Amp
Vol
Audio
Earpiece
90
DEMOD D/A
Delta Demod
Rx Audio
Audio/Data Switch
Data Data
Clk Out
Code Store
Decrypt
Clock Recovery
8
Encrypt
FIR
Splatter Filter
60
Clock
÷X
÷Y
÷N
÷M
Phase DET
MOD/ VCO
PA
PA Match
RF TX
70
T/R
RF
Rx LNA
Rx VCO
MULT
IF Amp
Rx
Data Slicer
DET
Rx Loop Filter
REF OGC
IF Filter

Fig.4.

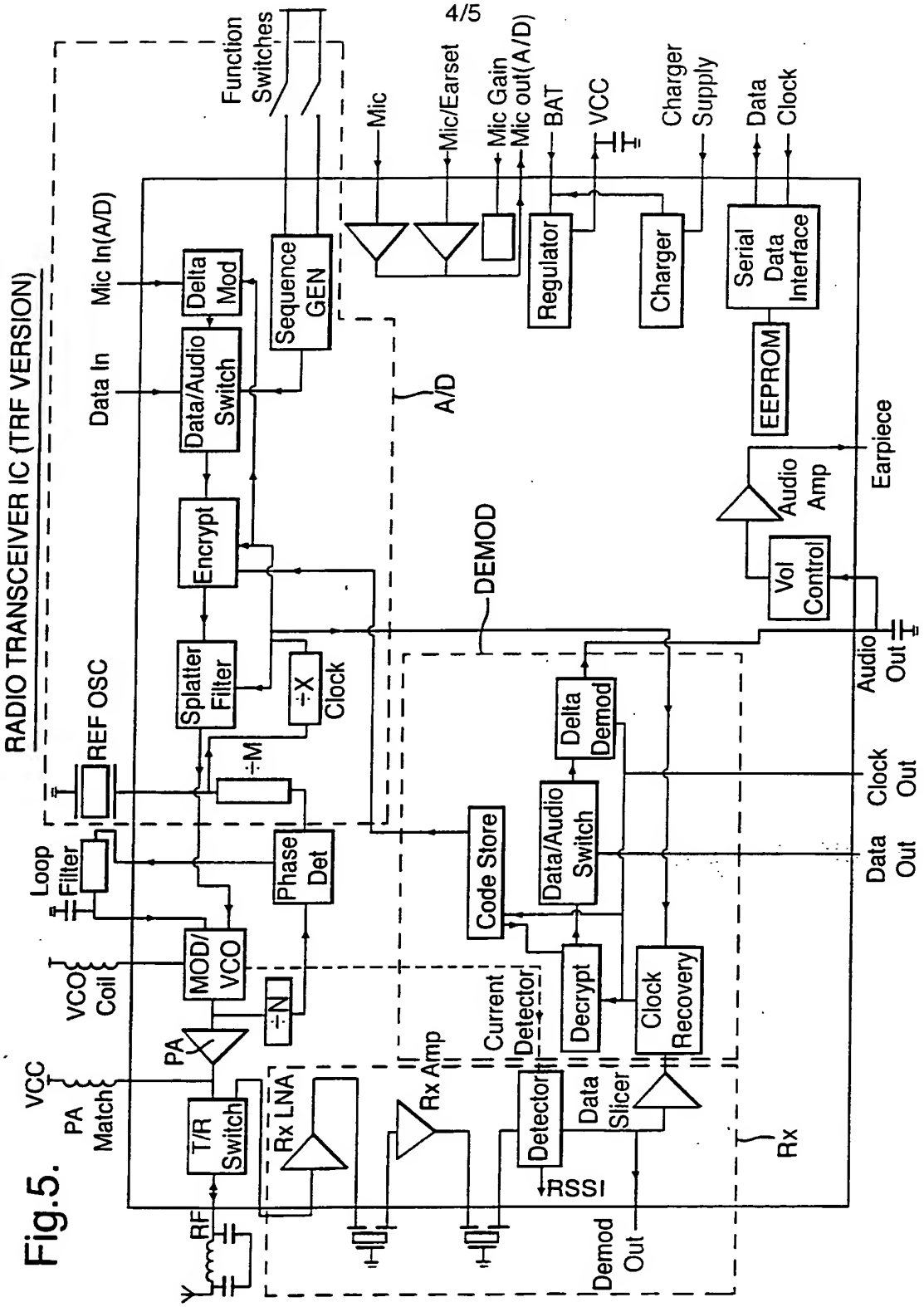

RADIO TRANSCEIVER IC (TRF VERSION)
Function Switches
Mic
Mic/Earset
Mic Gain
Mic out(A/D)
BAT
VCC
Charger Supply
Data
Clock
Mic In(A/D)
Data In
Delta Mod
Data/Audio Switch
Sequence GEN
Regulator
Charger
Serial Data Interface
EEPROM
A/D
Earpiece
Audio Amp
Vol Control
DEMOD
Encrypt
Splatter Filter
÷X
Clock
REF OSC
÷M
Loop Filter
Phase Det
Code Store
Delta Demod
Data/Audio Switch
Audio Out
Clock Out
Data Out
VCO Coil
MOD/ VCO
÷N
PA
Current Detector
Decrypt
Clock Recovery
VCC
PA Match
T/R Switch
Rx LNA
Rx Amp
Detector
Data Slicer
RSSI
Rx
RF
Demod Out

Fig.5.

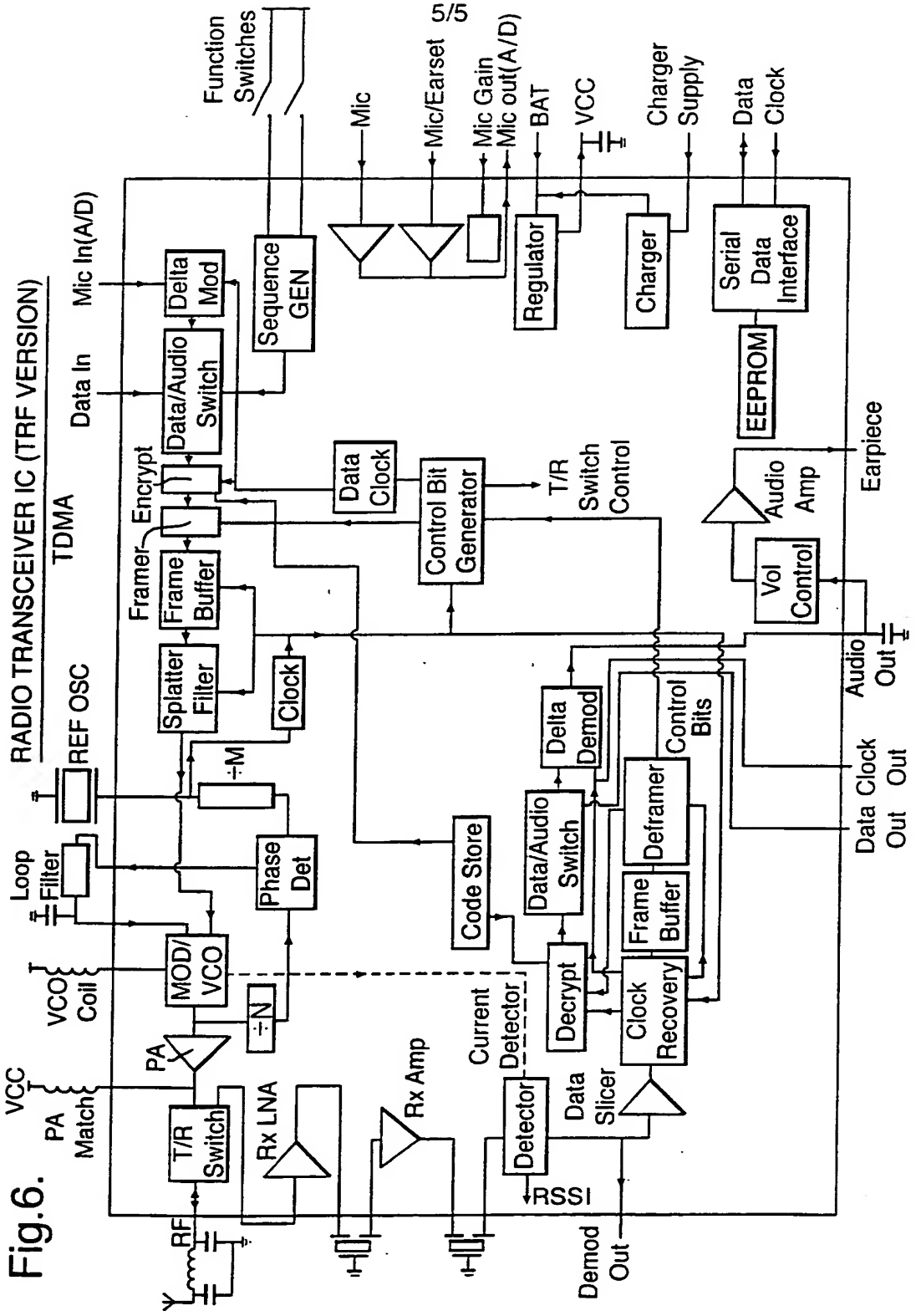

RADIO TRANSCEIVER IC (TRF VERSION)
TDMA
Function Switches
Mic
Mic/Earset
Mic Gain
Mic out(A/D)
BAT
VCC
Charger Supply
Data Clock
Mic In(A/D)
Data In
Delta Mod
Data/Audio Switch
Sequence GEN
Regulator
Charger
Serial Data Interface
EEPROM
Encrypt
Framer
Frame Buffer
Data Clock
Control Bit Generator
T/R Switch Control
Audio Amp
Earpiece
Vol Control
Splatter Filter
Clock
REF OSC
÷M
Loop Filter
Phase Det
Code Store
Delta Demod
Control Bits
Audio Out
Data/Audio Switch
Deframer
Data Clock Out
Out
Frame Buffer
MOD/ VCO
VCO Coil
÷N
Decrypt
Clock Recovery
PA
Current Detector
VCC
PA Match
T/R Switch
Rx LNA
Rx Amp
Detector
Data Slicer
RSSI
RF
Demod Out

Fig.6.

INTERNATIONAL SEARCH REPORT

Intern al Application No
PCT/GB 00/01685

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04M1/60 H04M1/05

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 296 19 070 U (PRELLE JUERGEN) 6 March 1997 (1997-03-06) page 5, last paragraph -page 6, paragraph 2; figure 1 page 7, paragraph 3; figure 2	1,4
Y		5,6
Y	GB 2 277 422 A (UNIVERSAL EXCHANGE LIMITED) 26 October 1994 (1994-10-26) page 5, last paragraph -page 6, paragraph 1; figure 1 page 7, last paragraph -page 9, paragraph 1	5,6
A	EP 0 789 474 A (NOKIA MOBILE PHONES LTD) 13 August 1997 (1997-08-13) abstract; figure 2	1,4

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
12 September 2000	20/09/2000

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern al Application No
PCT/GB 00/01685

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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GB 2277422 A	26-10-1994	NONE	
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		JP 10022863 A	23-01-1998